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(56) Documents Cited

**GB 1234482 A**      **EP 0371852 A**      **WO 92/05061 A**  
**DE 004422559 A**      **DE 004328156 A**      **US 4663980 A**  
**US 3944015 A**

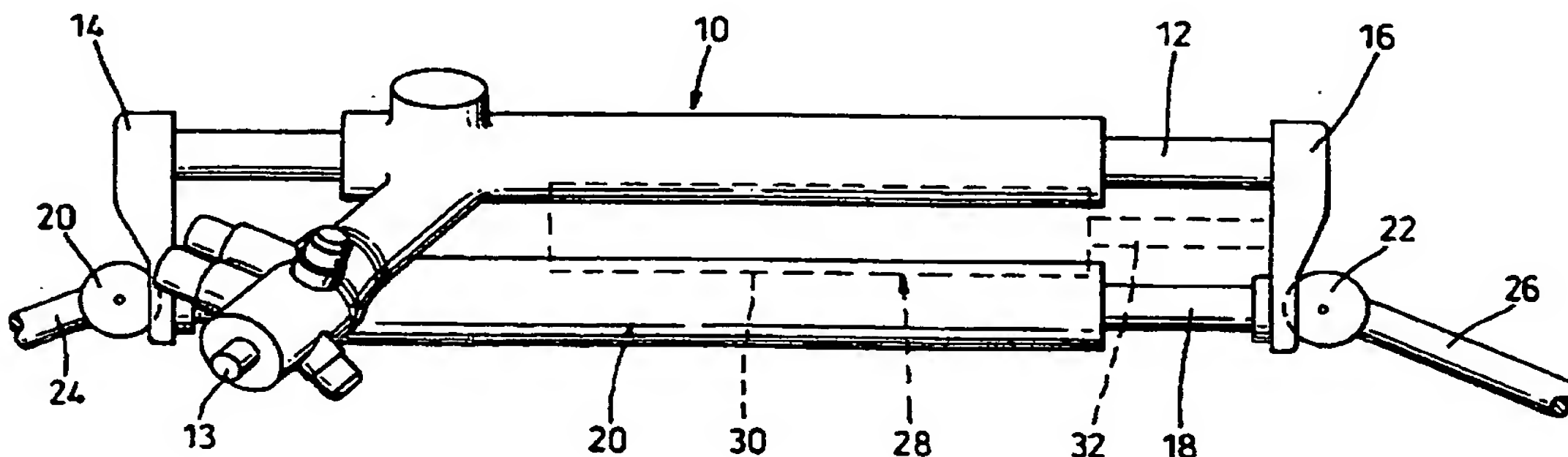
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(54) Abstract Title

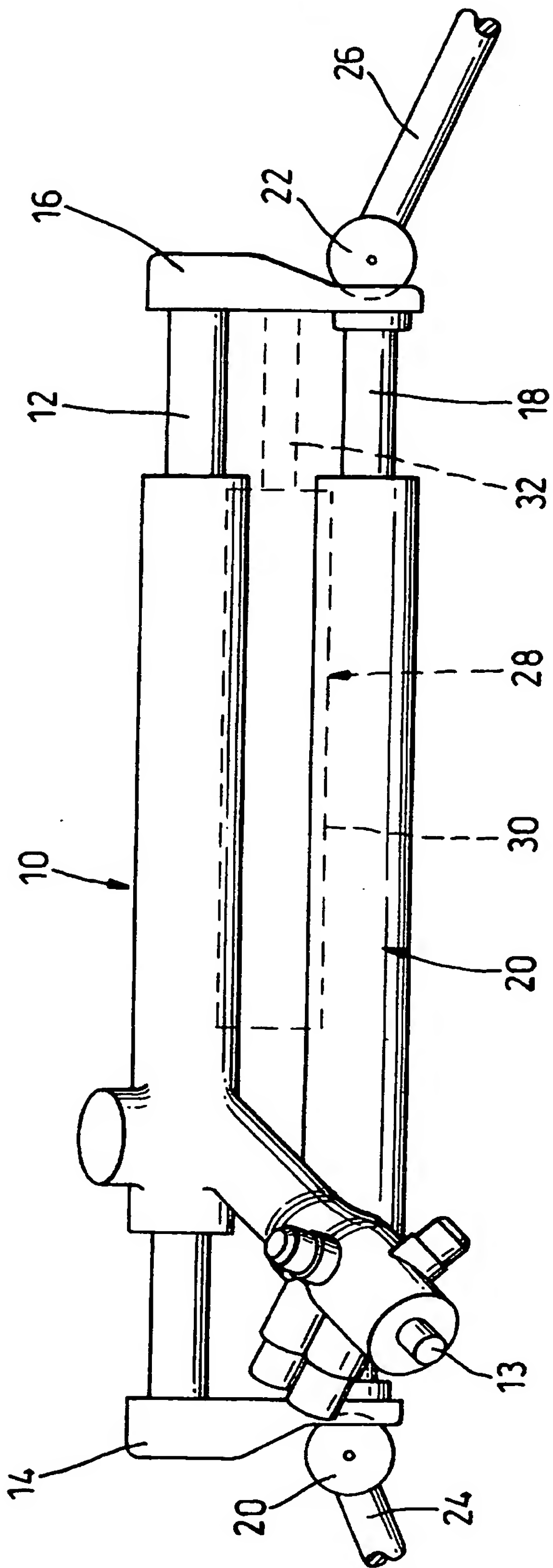
**Rack and pinion steering gear**

(57) The rack and pinion steering mechanism comprises a rack bar 12 mounted for linear movement in a rack bar housing 10. The ends of the rack bar 12 carry respective transverse arms 14, 16 interconnected by a rigid tie member 18 extending alongside the rack bar housing 10. Respective ball joints 20, 22 through which movement of the rack bar 12 is transmitted to track rods 24, 26 are positioned by the respective arms offset from the line of movement of the rack bar. This allows increased levels of steering geometry tuning. The rigid tie member 18 can be the piston rod of a power assistance unit 20. Also, a damper 28 may be provided for the steering mechanism. The damper comprises a housing 30 and a damper rod 32 connected to ones of the arms 14, 16.



GB 2 328 191 A

1/1



VEHICLE STEERING MECHANISMS

The invention relates to a rack and pinion steering mechanism for a motor vehicle.

A typical rack and pinion steering mechanism comprises a rack bar mounted for linear movement in a rack bar housing, the rack bar carrying a  
5 ball joint at each end through which movement is transmitted to a track rod. An arrangement of that kind can be seen in GB-A-1 580 531. When tuning steering geometry, the long established mounting of the ball joints on the rack bar requires the designer to make adjustments in other areas of the steering geometry and an object of the present invention is to provide a  
10 rack and pinion steering mechanism which will provide increased levels of steering geometry tuning.

According to one aspect of the invention there is provided a rack and pinion steering mechanism for a motor vehicle comprising a rack bar mounted for linear movement in a rack bar housing, the ends of the rack bar  
15 carrying respective transverse arms interconnected by a rigid tie member extending alongside the rack bar housing, and respective ball joints through which movement of the rack bar is transmitted to track rods, the ball joints being positioned by the respective arms offset from the line of movement of the rack bar.

Such an arrangement permits the position of the ball joints to be selected appropriately when tuning the steering geometry for a particular vehicle as the mechanism does not require the ball joints to be mounted at the ends of the rack bar.

5      Preferably, the tie member is parallel with the rack bar.

In a preferred embodiment, the ball joints are arranged in line with respective ends of the tie member.

The tie member may be a drive output member of a power assistance unit. In such a case, the drive output member may be a piston rod of the  
10      power assistance unit.

A damper may be provided for damping the steering movement and may be attached to one of the transverse arms and to a stationary part of the steering mechanism. The damper may be attached to one of the arms at a position between the associated ball joint and the rack bar.

15      According to a further aspect of the invention there is provided a motor vehicle having a rack and pinion steering mechanism according to the first aspect of the invention or to any other consistory clauses related thereto.

A rack and pinion steering mechanism in accordance with the invention will now be described by way of example with reference to the accompanying drawing which is a plan view of the rack and pinion mechanism.

The rack and pinion steering mechanism comprises a rack bar housing  
5 10 of known kind having therein a rack bar 12. The rack bar 12 is movable linearly by rotation of a pinion shaft 13 connected, in use, to a steering column of the vehicle.

In accordance with the invention, the ends of the rack bar 12 carry respective transverse arms 14, 16. Ends of the arms 16 spaced from the  
10 rack bar 12 are interconnected by a piston rod 18 of a power assistance unit 20 of known kind. The piston rod 18 is parallel with the rack bar 12.

The ends of the arms 16 adjacent the piston rod 18 carry respective ball joints 20, 22 which are connected to respective track rods 24, 26.

A damper 28 may be provided for the steering mechanism. The damper  
15 28 comprises a housing 30 connected to, for example, the rack housing 10 and a damper rod 32 connected to the arm 16. The damper 28 could, instead, be arranged such that the damper rod 32 is connected to the transverse arm 14.

The steering mechanism may be of a non-power assisted type. In such a case, the piston rod 18 would be replaced by a suitable rigid member such as a bar which interconnects the arms 14, 16.

In a conventional rack and pinion steering mechanism, the ball joints  
5 20, 22 would be arranged at the ends of the rack bar 12 on the line of movement thereof. The provision of the arms 14, 16 offer the designer greater flexibility over the positioning of the ball joints 20, 22 relative to the rack bar 12 thereby providing increased levels of steering geometry tuning.

## CLAIMS

1. A rack and pinion steering mechanism for a motor vehicle comprising a rack bar mounted for linear movement in a rack bar housing, the ends of the rack bar carrying respective transverse arms interconnected by a rigid tie member extending alongside the rack bar housing, and respective ball joints through which movement of the rack bar is transmitted to track rods, the ball joints being positioned by the respective arms offset from the line of movement of the rack bar.
2. A rack and pinion steering mechanism according to Claim 1 in which the tie member is parallel with the rack bar.
3. A rack and pinion steering mechanism according to Claim 1 or 2 in which the ball joints are arranged in line with respective ends of the tie member.
4. A rack and pinion steering mechanism according to Claim 1, 2 or 3 in which the tie member is a drive output member of a power assistance unit.
5. A rack and pinion mechanism according to Claim 4 in which the drive output member is a piston rod.

6. A rack and pinion steering mechanism according to any preceding claim in which a damper is provided for damping steering movement.
7. A rack and pinion steering mechanism according to Claim 6 in which the damper is attached to one of the arms and to a stationary part of the steering mechanism.
8. A rack and pinion steering mechanism according to Claim 7 in which the damper is attached to one of the arms at a position between the associated ball joint and the rack bar.
9. A rack and pinion steering mechanism for a motor vehicle constructed and arranged substantially as described herein with reference to the accompanying drawing.
10. A motor vehicle having a rack and pinion steering mechanism according to any preceding claim.





Application No: GB 9717124.3  
Claims searched: 1-10

Examiner: Richard Jupp  
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**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK CI (Ed.O): B7H: HFD, HFQ, HHK  
Int CI (Ed.6): B62D: 3/02, 3/04, 3/12, 5/22, 5/24, 7/00, 7/06, 7/18, 7/20  
Other: Online: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB 1234482 A (ADWEST ENGINEERING LIMITED)	1-3
X	EP 0371852 A1 (REGIE NATIONALE DES USINES RENAULT)	1-3
X	WO 92/05061 A1 (ZAHNRADFABRIK FRIEDRICHSHAFEN AG)	1-5
A	US 4663980 A (KATSUYUKI NARITA)	
X	US 3944015 A (ARTHUR E BISHOP)	1-5
A	DE 4422559 A (MERCEDES-BENZ AG)	
A	DE 4328156 A (MERCEDES-BENZ AG)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.